Qualcomm enters reflective-screen scene

by Jonathan Sidener

The small, monochrome display screen on the Acoustic Research music and phone headset seems so retro at first glance - unless that first impression happens in broad daylight.

LIGHT BRIGHT - This working prototype of a Qualcomm phone display can be viewed in direct sunlight because it reflects light instead of using a backlight. CNS Photo by John Gastaldo. While it looks like the small screen on last decade's pagers, this display remains vibrant in direct sunlight, a significant change from LCD screens that require a battery-draining backlight to be visible in bright light.

Developed by Qualcomm, the music player's screen is a new type of reflective display often called "electronic paper." While the reflective displays have been showing up on electronic devices for years, the Acoustic Research screen is Qualcomm's first product in the emerging market.

In addition to being more visible in harsh light, the new reflective displays use less power than LCD versions, allowing smaller batteries or longer periods between charges.

Without increasing battery size, Acoustic Research was able to include a feature not found on most competing products: a display of caller ID, battery level and other text and icons. Acoustic Research, a subsidiary of Hauppauge, N.Y.-based Audiovox Corp., said it will have the ARWH1 headset on store shelves soon.

Like the Qualcomm display, the first mainstream products from competitors are monochrome. Researchers are scrambling to upgrade from black and white to color - a steppingstone on the way to color video. Other lines of research seek to make the displays thin and flexible. Put all of these attributes together and you have the holy grail of electronic paper: a thin, flexible, energy-saving screen capable of displaying color video - even in direct light.

Prototypes put a rolled-up, laptop-sized screen in a tube about the diameter of a broomstick. Laptops, mobile Web devices such as the iPhone and hand-held gaming systems such as the Nintendo DS could face tough competition from full-size displays that roll up and fit in a back pocket, say proponents of electronic paper.

That vision has languished since the 1990s. Qualcomm enters the reflective-display race as something of a dark horse with a new, but untested, technology.

The company says its technology can refresh the images on a screen quickly enough to produce video. And it says the technology can be upgraded to produce color. It also expects to be able to create the screens from flexible materials.

"Think of electronic paper as a triangle with three sides made up of color video, low power consumption and flexibility," said Lawrence Gasman, principal analyst at NanoMarkets, a Virginia technology market research firm. "There are displays that do two sides of the triangle - one is flexible and does color video, but has high power consumption - but no one has done all three."

Next year, Qualcomm plans to introduce a two-color version of its monitor and says it will produce a larger display for a Chinese phone manufacturer. Beyond that, it's not disclosing its timetable for upgrading its reflective display technology.

The San Diego cell phone technology company will need to be on the fast track if it hopes to make up lost ground. Several electronic paper displays are on the market, including the Sony Reader electronic book, a watch from Seiko and the Motofone from Motorola. All of these products use a technology from E Ink of Cambridge, Mass.

While the cost of future full-color, flexible versions isn't known, E Ink's monochrome displays can cost less than LCD displays. Motorola used the technology for a phone it sells in emerging markets in part because it was less expensive than an LCD display.

E Ink's electronic ink technology consists of millions of microscopic capsules - each like a snow globe that contains black and white particles. An electronic charge determines whether the black or white particles float to the top, effectively creating black pixels that turn on and off against a white background.

E Ink has demonstrated the ability to produce color images and says it can refresh pixels quickly enough to display video. The company's technology has so dominated the early years of reflective displays that its name is often synonymous with electronic paper, which perhaps explains why Qualcomm is eager to distance itself from the phrase.

"If you went to a Society for Information Display conference, you wouldn't hear our technology called electronic paper," said James Cathey, vice president of business development for Qualcomm MEMS Technologies division.

MEMS is short for micro-electromechanical systems, which uses computer-chip technology to make tiny machines.

Qualcomm's technology lacks a catchy alternative name. Cathey called it a reflective display based on MEMS technology, or more precisely, IMOD, short for Interferometric Modulator Displays.

"The Acoustic Research device is the first reflective display driven by MEMS technology," Cathey said. "We're pretty excited about that."

The MEMS display works on the principle that light waves can be made to interfere with one another to produce the illusion of pigment. The best-known example occurs when a clear oil is poured on clear water,

thus creating a rainbow of colors without pigment. The oil and water create two parallel reflective surfaces, which makes the light waves bounce in odd ways. The unusual bounce of one light wave interferes with another and produces colored light.

Qualcomm's technology harnesses this effect on a microscopic level, creating thousands of pixels in a small space. By manipulating the effect, it can control the color produced by an individual pixel.

The company is entering a field full of competitors but poised for growth, said Gasman, the analyst. There are about 20 competitors, but not all of them are looking at the mobile-device market, he said.

In a recent report, Gasman forecast that the market for electronic paper displays on cell phones would grow from about $14 million this year to $114 million by 2010 and $763 million by 2014.

That assumes that electronic paper is capable of doing everything that today's LCD screens do while using less power. If the technology hurdles are resolved, electronic paper could be a compelling technology, Gasman said.

"Today, my cell phone has portable versions of Microsoft Office software, but I'm not going to work on spreadsheets on a little cell phone screen. No one is," Gasman said. "But I would if I had a big screen that I could roll up and simply put in my pocket."

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